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Une expérience d'enseignement assisté par ordinateur a été menée à la faculté de médecine de l'Université Laval en 1973; elle portait sur les cours de cardiologie en troisième année du cours de médecine. La recherche qui y était liée visait à mesurer le degré d'apprentissage, l'efficacité pédagogique apparente et les perceptions des étudiants.

Deux groupes d'étudiants étaient concernés par la recherche: le groupe I, composé de 23 étudiants, a reçu une transcription écrite du programme de cours conçu pour l'ordinateur et manipulait lui-même l'équipement audiovisuel qui y était lié; le groupe II, composé de 22 étudiants, a reçu les mêmes cours sur un terminal auquel était relié l'équipement audiovisuel, le langage utilisé étant le Courseuriter [1]. Un groupe contrôle était composé d'autres étudiants recevant les mêmes cours de façon traditionnelle. Par la suite, on a administré aux étudiants des deux groupes de recherche le test PERPE/LPI, comportant 47 items pour le groupe I et 57 pour le groupe II, chacun comprenant une échelle en cinq points et deux questions sur la perception qu'a l'étudiant de la réalité et sur le niveau de ses attentes ou désirs.

Les résultats montrent une réaction généralement positive des étudiants aux deux types d'enseignement programmé qui ont été expérimentés. Cependant, les rares différences de perception entre les deux groupes expérimentaux montrent que les contraintes imposées par le système informatique, spécialement sa séquence de fonctionnement trop rigide, ont amené les étudiants à réagir de façon plus négative à ce système qu'à son équivalent écrit.

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Title: Students' Perceptions of a CAI Course in Cardiology

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ABSTRACT

Two experimental groups in their third year of Medical School were presented a series of four lessons in cardiology, one group (II) through a fully-operating CAI system, the other (I) with a similar programmed course, but with the information normally displayed on the cathode ray screen being presented in a written text. Students' perceptions were gathered in each group with a questionnaire using a discrepancy model; satisfaction thus became a difference between perceived reality and desires. The results showed an agreement between the two groups in terms of high or low satisfaction scores ($r = +.66$). But, contrary to expectations, group II appeared globally more dissatisfied than group I. An analysis of the seven items in which group II was significantly more dissatisfied revealed that the source of their higher dissatisfaction could be attributed to an excessive rigidity in the CAI program used, whose strictly linear structure did not allow branchings or forward and backward jumps.

I - Description of the experiment

The Faculty of Medicine at Laval University initiated an experimental program in computer-assisted instruction (CAI) in 1973. The first courses dealt with cardiology. The experiment was conducted by two of the authors.

The research model intended to measure: a) amount of learning; b) perceived pedagogical effectiveness; c) student perceptions. Two experimental groups were tested during two consecutive semesters.

Group I was composed of 23 students in their third year at Medical School, randomly selected among 152 students. Because of delays in the computer support, this group could not receive the four CAI lessons. As a substitute, it was decided to transcribe faithfully on paper the computer programs and to leave to the student the handling of the audio-visual equipment (slide projector and tape recorder) which was part, with the computer terminal, of the CAI system.

During the second semester, Group II (22 students in the same academic year) was given the same four lessons through a fully operating CAI system. The contents were presented on a "Lektromedia" terminal linked to an IBM 370 computer. The terminal controlled three elements: a cathode ray screen, a slide projector and a cassette tape recorder. Programs were written in IBM Courseswriter III language, but its capabilities were restricted by the use of a time-sharing link with the computer: no branchings or backward and fordward jumps could be introduced into the program.

The two experimental groups were compared to similar control groups which were presented with the same course content through conventional lectures. The scores on a multiple-choice exam for Groups I and II were respectively 19% and 24% higher than those of the control groups. The lack of a significant difference between groups I and II did indicate a similar degree of pedagogical effectiveness as measured by the post-test. An analysis of the students' perceptions appeared then an interesting way to point out possible differences between the two experimental conditions.

II - Students' perceptions

A. Method

Students were presented, at the end of each series of lessons, a questionnaire specially designed to determine their perceptions about different aspects of the pedagogical environment. Group I's questionnaire had 47 items as compared to 57 items on Group II's; the ten additional items measured aspects deemed specific to the CAI situation.

Figure 1 about here

As shown in Figure 1, two questions were asked for each item. Question A intended to measure the student's perception of reality, while Question B measured the level (higher or lower than A) of his desires. From the answers given to both questions, a measure of satisfaction was

(2417) SCHEDULE: does the schedule facilitate your access to the CAI equipment?

1. Very rigid schedule
2. Rigid Schedule
3. More or less flexible schedule
4. Flexible schedule
5. Very flexible schedule

Question A: Where do you place this course on the evaluation scale?

Question B: Where should it be placed so that you would be satisfied?

Figure 1. Typical item format in the PERPE/LPI questionnaire used for this research.

obtained. This simply corresponds to the absolute discrepancy between A (reality) and B (desires). This psychometric technique (initiated by Porter (1961) in the field of Job Satisfaction) was independently devised by one of the authors (Gagné and Chabot, 1970) to measure students' perceptions of teaching. A large number of psychometric studies have been carried out by a research team presently associated with l'Institut National de la Recherche Scientifique (Universite du Québec). The three main constructs presented above are considered substantially valid (Gagné and Allaire, 1974).

By comparing the reality (R) and desires (D) means for a given item, it is possible to identify the direction of the dissatisfaction expressed, in terms of deficiency or excess, for the characteristic being measured. Interpreting these pairs of means is simple, since point 1 on the scale refers to a minimum intensity or frequency, while point 5 represents a maximum (see Figure 1). For example, the lower the R (reality) mean on item 0503 (Table 1), the less structured the course is perceived. If the D (desires) mean was lower than the R mean it would signify that students on the average desire a less structured course content.

As for the satisfaction scores (S), the lower they are - near zero - the more that particular aspect of the course is judged satisfying. The S scores may be compared between items within each group or between groups within items; they also can be added to create a global measure of satisfaction for a given group. These global S scores have

been shown reliable and valid indications of the general "satisfactoriness" of a course (Gagné and Allaire, 1974).

B. Results

Table 1 summarizes the main data. The left-hand column gives the item's position in each questionnaire. The R, D and S means are presented for each item in each experimental group. Global S means were computed over all items as well as all common items, by averaging item S scores.

Table 1 about here

1. Common results

The scores of each item follow a similar pattern in both experimental groups. Indeed, a correlation coefficient of +.66 was obtained between the two series of common S scores ($df = 45$; $p < .001$). This general similarity in the profiles makes possible the identification of many common points, in terms of high satisfaction as well as high dissatisfaction.

Students in both groups considered themselves especially satisfied with the following items: a) the sufficient quantity of information covered by the course (item 0101); b) the generally high density of the course's content (item 0202); c) the high degree of structure in the course (item 0503); d) the high frequency of questions asked during the course (item 1008); e) the good quality of the exercises presented (item 1210); f) the moderate importance given to memorizing (item 1813); g) the

Table 1

Reality (R), Desires (D) and Satisfaction (S) means for each item in experimental groups I and II

Position code	Titles of items	Group I			Group II			't' tests
		R	D	S	R	D	S	
0101	Quantity of subject matter covered	3.81	3.81	0.38	3.74	4.17	0.43	
0202	Substantial course content	4.05	4.24	0.38	4.30	4.65	0.35	
0300	Necessity to take notes				3.26	2.87	0.74	
0400	Uniform density of content from course to course				3.86	3.95	0.09	
0503	Course structure	3.52	3.76	0.43	3.91	4.17	0.26	
0604	Rigidity of content sequencing	3.38	4.05	0.86	1.74	3.70	2.22	***
0705	Informations about the course's structure	2.75	3.80	1.05	2.09	3.52	1.43	
0806	Frequency of syntheses	3.48	4.24	0.76	3.78	4.48	0.70	
0907	Availability of supplementary information	2.19	4.10	1.90	1.45	4.09	2.64	*
1008	Frequency of questions during the course	3.85	4.30	0.45	4.22	4.52	0.30	
1109	Difficulty of exercises	2.79	3.11	0.42	2.83	3.43	0.61	
1210	Exercises focused on comprehension	4.05	4.50	0.45	4.13	4.48	0.35	
1500	Detailed analysis of answers				1.86	4.23	2.45	
1611	Accuracy of comments	3.80	4.75	0.95	3.70	4.57	1.04	
1712	Tone of remarks	4.35	4.53	0.29	3.13	3.52	0.57	
1813	Importance given to memorizing	3.00	2.90	0.38	3.48	3.65	0.35	
1914	Questions generated by the course	3.19	3.14	0.62	3.09	3.52	0.61	
2018	Answers to students' questions	3.57	4.48	0.90	4.04	4.74	0.70	
2100	Frequency of repetitive loops				3.48	4.52	1.04	

* = $p < .05$; ** = $p < .01$; *** = $p < .001$

Table 1 (continued)

Position code	Titles of items	Group I			Group II			't' tests
		R	D	S	R	D	S	
2200	Frequency of comparative evaluations				1.30	3.39	2.09	
2315	Workload	2.00	2.45	0.55	1.83	2.17	0.70	
2417	Flexibility of the schedule	3.35	4.60	1.25	3.13	4.43	1.30	
2500	Simplicity of keyboard commands				4.26	4.52	0.26	
2619	Intensity of surrounding noise	3.95	4.60	0.65	4.83	4.91	0.09	••
2720	Visual fatigue	4.24	4.57	0.33	4.61	4.74	0.13	
2821	Fatigue due to concentration	3.00	3.50	0.50	3.78	4.00	0.48	
2922	Frequency of content errors	3.90	4.70	0.80	4.48	4.74	0.26	•
3000	Frequency of delays (computer system)				3.61	4.78	1.17	
3124	Frequency of breakdowns	3.19	3.14	0.62	2.26	4.96	2.70	•••
3223	Variations in the pedagogical approach	2.33	3.48	1.14	2.39	3.74	1.52	
3300	Variations in the media used				3.78	4.13	0.52	
3400	Frequency of use (cathode-ray screen)				4.87	4.65	0.39	
3525	Frequency of use (written documents)	4.43	3.86	0.86	1.32	2.73	1.41	(•••)
3626	Frequency of use (tape recorder)	3.24	3.62	0.67	3.04	3.61	0.65	
3727	Frequency of use (slide projector)	3.67	4.19	0.52	3.57	4.17	0.61	
3828	Frequency of use (group work)	1.35	3.12	1.88	1.14	2.55	1.41	
3929	Clarifying readings	3.14	4.00	0.86	3.89	4.21	0.32	
4030	Frequency of an inductive approach	2.80	3.55	0.75	2.35	3.70	1.43	•
4131	Frequency of a deductive approach	3.86	3.76	0.57	3.83	3.87	1.09	

[2] This discrepancy becomes statistically significant if we take into account the direction of the dissatisfaction, that is an excess in Group I and a deficiency in Group II.

Table 1 (continued)

Position code	Titles of items	Group I			Group II			't' test
		R	D	S	R	D	S	
4232	Student-centered approach	3.42	4.21	0.89	2.04	3.96	1.91	**
4333	Active participation of students	4.05	4.52	0.48	4.26	4.65	0.39	
4434	System's relevance to content	4.33	4.62	0.29	4.43	4.78	0.35	
4535	Relevance of audio-visual media to specific contents	4.05	4.38	0.33	3.78	4.87	1.09	**
4636	Clarity of language	4.29	4.76	0.48	4.57	4.78	0.22	
4737	Richness of vocabulary	3.35	3.45	0.30	3.78	4.00	0.22	
4838	Frequency of examples	2.70	4.00	1.30	2.52	4.13	1.61	
4939	Clarity of examples	3.65	4.35	0.71	3.30	4.52	1.22	
5040	Captivating presentation	3.52	4.33	0.81	4.04	4.70	0.65	
5141	Captivating content	4.19	4.52	0.33	4.61	4.96	0.35	
5242	Captivating course (general)	3.95	4.38	0.43	4.17	4.70	0.52	
5343	Importance of tutoring	3.65	3.95	0.30	3.64	3.64	0.18	
5645	Availability of tutor	3.06	3.67	0.61	3.87	4.39	0.52	
5746	Planning of student work	2.83	3.39	0.67	3.00	3.50	0.86	
5847	Directing student to outside consultants	1.55	2.27	0.73	1.71	2.50	0.79	
5900	Delays in answering students' questions				4.10	4.20	0.10	
6048	Frequency of supervisory initiatives	4.00	4.18	0.29	3.96	3.91	0.39	
6149	Need for verbal exchange between students	3.45	3.70	0.45	3.22	3.30	0.17	

lack of visual tiredness associated with both learning situations (item 2720); h) the clarity (item 4636) and richness (item 4737) of the language used; i) the highly captivating course content (item 5141); j) the importance of tutoring and student supervision during the course (item 5343); k) the high frequency of supervisory initiatives by the tutor (item 6048).

On the other hand, both groups appeared very dissatisfied with: a) the lack of information about the structure of the course (item 0705); b) the limited access to supplementary documentation related to the course's content (item 0907), either in the course itself or through external resources; c) the lack of flexibility in the schedule prepared to control the students' access to the audio-visual equipment (item 2417); d) the infrequent use of group work (item 3828); e) the insufficient frequency of examples (item 4838).

Among the ten items which were presented to Group II only, two instances of high dissatisfaction are worth noting: a) a lack of fineness in the analysis (by the program) of the students' incorrect answers (item 1500); b) the almost total absence of comparative evaluations (item 2200), that is exams through which students could compare their results to those of their colleagues. Even though feedback procedures appeared quite frequent to the students in both groups (item 1008), it seems that their usefulness was more dependant upon modalities (items 1500 and 2200) than frequency as such; it can be hypothesized that students, confronted with a fair number of incorrect answers, may feel insecure about their progress. By knowing their class standing, this feeling of insecurity could be alleviated.

2. Differential results

As previously noted, experimental condition II differed mainly from I by the use of a fully-operating CAI system. In situation I, the "Lektromedia" console was replaced by a written text. Did this important modification influence in one way or another the students' perceptions?

First, there is a statistically significant difference between the two groups in terms of their global satisfaction (t. dep. = 1.97; df = 45; p = .06). But, contrary to expectations, it is Group I (without CAI) which declares itself more satisfied with the teaching environment. There are some clues pointing to the computer program as the main contributing factor to a greater dissatisfaction in Group II.

In order to identify those items whose S scores differed significantly in one group as compared to the other, Student's 't' test for independant samples was computed for each of the 47 pairs of S scores. Nine (9) tests gave statistically significant results, and in seven (7) cases Group II appeared more dissatisfied than Group I (cf. Table 1).

While discrepancies favoring Group II focused on technical details, that is a lower level of surrounding noise (item 2619) and a smaller number of content errors (item 2922), most differences favoring Group I focused on central aspects of the learning environment and implicated directly the program which controlled the CAI terminal. For example, students in Group II complained of more frequent breakdowns in the system (item 3124). They also pointed out a much greater rigidity in the contents' sequencing (item 0604). This result may appear surprising at

first glance, since the paper transcription reproduced exactly the content and sequence of the computer program. But, with the written text, the student could "break" the sequence, come back to earlier modules any time he wished, take a look at future contents, while the computer program imposed on the student a strict linear sequencing of contents. This unavoidable rigidity seems to have generated much frustration, as evidenced by the S score of Group II on item 0604. A similar problem is shown on item 0907 (Accessibility to supplementary information) which generated high dissatisfaction in both groups, but significantly more in Group II. Moreover, students in Group II judged their course to be less student-centered (item 4232) than those in Group I.

Finally, the computer console appeared directly questionned in item 4535, as well as in items 3400 through 3828. In the case of item 4535 (Relevance of audio-visual media to specific contents), the presence of the computer terminal might explain a higher degree of dissatisfaction among Group II students. This hypothesis receives some support in items 3400 through 3828. Indeed, students in Group II signalled a deficiency in the frequency of use of all media but the computer console. They indicated their strongest dissatisfaction with the use of written documents. As far as the computer console is concerned, these same students placed their desires (D = 4.65) at a lower level than their observed frequency of use (R = 4.87).

Conclusions

The above results show generally positive student reactions to the two types of programmed instruction experimented. However, the few significant differences between experimental conditions I and II confirm in most cases that the constrainte imposed by the computer system, specially its rigid sequencing, brought students to react more negatively towards the CAI system as compared to a similar "paper and pencil with audiovisual materials" approach. Yet, the students' judgment is not very harsh, since students in Group II declared themselves satisfied with the computer medium (item 3400). But, considering their reactions to other items, one might wonder to what extent the novelty of this electronic system of instruction induced a lenient perception toward the medium as such.

A brief investigation of the existing literature did not disclose any other comparative study of students' perceptions of different learning situations. The most recent review of literature in the field (Jamison, Suppes and Wells, 1974) did not mention such a study. From the above results, further similar analyses appear clearly desirable. Indeed, to the extent that effectiveness criteria have not shown themselves to permit a clear choice between different teaching techniques (Jamison, Suppes and Wells, 1974, p. 55; Dubin and Taveggia, 1968), student reactions could become a more promising basis to justify the adoption of one system of instruction over another.

REFERENCES

DUBIN, R. and TAVEGGIA, T.C. (1968) The Teaching-Learning Paradox. Teaching methods. Center for the Advanced Study of Educational Administration. University of Oregon.

GAGNE, F. and ALLAIRE, D. (1974) Reliability and construct validity of a discrepancy approach to measuring student perceptions of teaching. Paper presented as part of a symposium held during the 82nd Annual Convention of the American Psychological Association, New Orleans, Louisiana. Montréal: INRS-Education.

GAGNE, F. and CHABOT, M. (1970) PERPE: une conception neuve du perfectionnement pédagogique. PROSPECTIVES, vol. 6, no. 3, pp. 160-181.

JAMISON, D., SUPPES, P. and WELLS, S. (1974) The effectiveness of alternative instructional media: a survey. Review of Educational Research, vol. 44, no. 1, pp. 1-68.

PORTER, L.W. (1961) A study of perceived need satisfaction in bottom and middle management jobs. Journal of Applied Psychology, vol. 45, no. 1, pp. 1-10.